# THE EFFECT OF ISOLATION TIME TO THE THERMAL DEGRADATION OF CELLULOSE NANOFIBER (CNF) AND CARBOXYMETHYL CELLULOSE NANOFIBER (CM-CNF)

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This Final Year Project Report entitled "**The Effect of Isolation Time to The Thermal Degradation of Cellulose Nanofiber (CNF) and Carboxymethyl Cellulose Nanofiber (CM-CNF)**" was submitted by Abdul Hafidz Mohd Raffe, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

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## ABSTRACT

### THE EFFECT OF ISOLATION TIME TO THE THERMAL DEGRADATION OF CELLULOSE NANOFIBER (CNF) AND CARBOXYMETHYL CELLULOSE NANOFIBER (CM-CNF)

In this study, oil palm empty fruit bunch OPEFB fiber biomass was pre-treated using sodium hydroxide (NaOH) and bleaching. The cellulose nanofiber was isolated by alkali treatment with different isolation time (2,4 and 6 hours) and sonicate at 55 ºC for 3 hours. The carboxymethyl cellulose nanofiber (CM-CNF) was synthesized using two steps that is alkalization using 20% of NaOH and etherification using monochloroacetic acid (MCA). The CNF and CM-CNF obtained were characterized using Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy, Ultraviolet visible (UV-Vis) spectrophotometer and Thermalgravimetric Analyzer (TGA). result obtained shows that the CNF isolated for 2 hours has a highest percentage yield which is 20.40 % while there is no major different in percentage yield for the CM-CNF synthesized. From the FTIR spectra obtained, the peaks at 1700 $cm^{-1}$ and 1200 $cm^{-1}$ of hemicellulose and lignin were efficiently removed after bleaching process while for CM-CNF, the peak around 1600 $cm^{-1}$ was appeared represent carboxylate ($COO^{-}$) group. The determination of nano size in CNF was determine using UV-Vis spectroscopy. Result show that the percentage transmittance for the isolated CNF is more than 95 % at wavelength of 600 nm. From the TG curve obtained, it shows that all samples has a three phases of degradation. The onset degradation temperature for bleached OPEFB is lower than the raw OPEFB due to the removal of hemicellulose and lignin. The CNF isolated for 4 hours has a good thermal stability with the degradation temperature of 311.81 ºC and the production of CM-CNF has high thermal stability compared to the CNF isolated.